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SELECTED TRANSLATIONS ON THE SOVIET CONSTRUCTION AND BUILDING MATERIALS INDUSTRY -- No 9

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1. Potential for Reducing Cement Consumption by Precast Reinforced Concrete Elements Enterprises

/This is a translation of an article written by A. Berezin and V. Pokrovskiy in Ekonomika Stroitel'stva (Economics of Construction), No 10, Moscow, Oct 1959, pages 41-47./

Recently, an inspection team from the Rosglavstroysnabsbyt /Main Construction Supply and Marketing Administration RSFSR/ under the Gosplan /State Planning Commission/ RSFSR examined the storage, consumption and utilization of cement in 11 precast reinforced concrete plants. The combined output capacity of these plants approximates one million cubic meters of precast, reinforced concrete annually, and approximately the same quantity of marketable concrete.

The objects to be inspected were selected for the purpose of obtaining the fullest and most variegated data on cement consumption in precast reinforced concrete components plants and uncovering potentials for economization. Therefore, the inspection was extended to both large highly mechanized and modernly equipped enterprises (Lyubertsy Combine No 2, Moscow Reinforced Concrete Plant No 1) and relatively small and poorly mechanized ones (Ul'yanovsk and Bryansk reinforced concrete elements plants).

The principal aim of the inspection was to uncover non-productive expenditures of cement in enterprises of the precast, reinforced concrete industry, as well as to re-examine their effective norms for cement consumption and the factors -- both general and local -- affecting the establishment of these norms.

To clarify more precisely the causes of non-productive expenditures of cement and to systematize the results of the inspection, all non-productive expenditures were broken down into two basic groups -- direct losses of cement, and overconsumption of cement in excess of the effective norms.

In the first group were included the non-productive expenditures of cement relating to the cement that did not become part of the finished product but was lost prior to, or during, the process of fabrication of the product. Such losses included losses of cement during unloading, storage and intra-plant transport (chiefly, escape in the form of dust); losses of cement in the form of losses of concrete (over-pouring of concrete); and losses of cement involved in the rejection of defective products.

The second group included the non-productive expen-

ditures of cement relating to the cement already contained in finished products but not consumed according to GOST /All-Union State Standard/ requirements or conditions for product strength. This group pertains to exorbitant norms of cement consumption resulting in a higher strength of the finished products, and excess consumption of cement because of the use of non-standard inert materials. . . .

In terms of absolute value, the non-productive expenditures of cement in the 11 inspected plants amount to approximately 70,000 tons annually. Taking into account that the inspected plants are typical of the precast, reinforced concrete industry, there exists a basis for assuming that the non-productive expenditures of cement are also substantial in the other plants.

Compared with the other forms of losses of cement, the losses during unloading and transport are most considerable. On the average they account for 6.2 percent of the cement used in industry, and they reach the highest share at the Lipki Plant (approximately 17 percent).

The reasons for such considerable losses of cement are absent or insufficient mechanized means of unloading; absent or insufficient means of transporting cement; unsuitability of plant premises for the storage of cement. . .

The losses of cement stemming from the overconsumption of concrete were considered in relation to the total consumption of cement, inclusive of the consumption of cement on the production of marketable concrete. Inasmuch as the overconsumption of marketable concrete in enterprises of the precast, reinforced concrete industry cannot be taken into account, therefore the percentage of cement losses stemming from the overconsumption of concrete was found to be somewhat lower than the percentage of the overconsumption of concrete in relation to the cubic volume of the fabricated products.

The mean weighted percentage of cement losses stemming from the overconsumption of concrete in the inspected enterprises was 4.3 percent of the total amount of cement consumed for production, and it ranged from 1.5 percent at the Serpukhov Reinforced Concrete Pipe Plant to 11 percent at the Stalingrad Reinforced Concrete Plant.

The losses of cement stemming from the overconsumption of concrete were caused by the latter's transport from concrete-mixing shops to concrete-pouring sites, by the over-pourings of concrete, and by the decrease in the coefficient of the hollow space of products. . . .

The magnitude of the losses of cement in rejects of finished products averaged, for the inspected plants, 1.1

percent of the amount of cement consumed for production, and reached its maximum (2.5 percent) at the Lyubertsy Plant.

The principal reasons for rejection, and hence also for losses of cement in rejects, are infractions of the regime of the heat treatment (curing) of reinforced concrete elements, resulting in the appearance of cracks; and mechanical damages during the disassembling of molds.

In turn, mechanical damage during the disassembling of molds is in the majority of cases caused by the unsatisfactory lubrication of molds.

It should be noted that in the enterprises which do not permit infractions of the technological modes of heat treatment (Gor'ki Precast Reinforced Concrete Plant No 1), the percentage of rejects is minimal.

The overconsumption of cement as a result of increasing the strength of products averaged, for the 11 inspected plants, 3.1 percent of the amount of cement consumed for production, and reached its maximum (over nine percent) at the Stalingrad Plant.

This last type of overconsumption of cement was caused by increase of cement dosages by plant laboratories; the practice of mixing high-grade with low-grade cements; and the use of high-grade cements for fabricating low-grade concretes and mortars.

The quotas of cement consumption observed in precast, reinforced concrete plants vary broadly under analogous conditions. Thus, e. g., the quota of cement consumption for the fabrication of grade-"200" reinforced concrete components from grade-"500" cement at the Gor'ki Plant No 1 amounts to 230 kilograms per cubic meter, while at the Moscow Reinforced Concrete Plant No 1 it amounts to 319 kilograms per cubic meter -- or nearly one and one half times as much. In a number of plants (Gor'ki, Ul'yanovsk, Voronezh, and others) the quotas for portland cement, portland-slag cement and pozzuolanic cement are the same -- all other conditions remaining equal -- while in the plants of the Glavmospromstroymaterialy /Main Moscow Administration of the Building Materials Industry/ the quotas for portland-slag cement and pozzuolanic cement are set higher than for portland cement.

Some precast, reinforced concrete plants include in their cement consumption norms an allowance for the shrinkage of cement during vibration, while others write off cement for shrinkage according to the process.

It is relevent to note that precast reinforced concrete plants follow no rigidly established standards for

concrete shrinkage and employ differing norms.

The fact that the plants' laboratories increase the dosages of cement is confirmed by the additional fact that the products display a greater strength than their grades indicate. Thus, at the Stalingrad Plant the mean weighted cubic strength of grade-"200" products after 28-day exposure amounted to 300 kilograms per square centimeter, while at the Moscow Reinforced Concrete Plant No 1 it amounted to 264 kilograms per square centimeter.

Of course, the norm of consumption of cement for the production of reinforced concrete components depends not only on its type and grade but also on many other factors: quality of inert materials, degree of plasticity of concrete, etc. In turn, the degree of plasticity of concrete, as established by laboratories, depends to a major extent on whether a given plant possesses facilities for concrete vibration, since a shortage of these facilities often compels the plants to desist from using rigid concretes and to convert to plastic ones -- especially under proving-ground conditions.

However, the differences in norms cannot be explained by these reasons alone. On comparing the norms followed at Gor'ki Plants No 1 and No 2, which operate under identical conditions, it can be observed that they differ from each other (Table 2). . . . .

Table 2

Grade of Cement	Type of Concrete	Grade of Concrete	Gravel-Sand Mixture From Kamskoye-Ust'ye Quarry		Calcareous Rubble From Vadskoy Quarry	
			Plant No 1	Plant No 2	Plant No 1	Plant No 2
400	Marketable	75	-	-	160	180
400	Ditto	100	-	-	193	200
400	Structural	150	230	265	-	-
400	Ditto	200	285	360	-	-
500	"	150	220	255	-	-
500	"	200	250	325	-	-

Note: The norms of cement consumption are given in kilograms per cubic meter of solid concrete.

The overconsumption of concrete stemming from the use of nonstandard inert material has averaged, for the inspected enterprises, 2.7 percent of the cement consumed for production; it reached its maximum (9.2 percent) at the Bryansk Plant.

During the inspection of the plants it was noted that their use of inert material deviated as follows from GOST requirements: use of extensively polluted sands and sands not satisfying the GOST requirements as to granulometric composition; use, instead of rubble or gravel, of a sand-gravel mixture with a low gravel content; use of unscreened gravel with a high content of pulverulent particles; and use of gravel based on rock having a low and short-lasting compressive strength. . . .

From the foregoing it may be concluded that enormous latent potentials for saving cement exist in precast reinforced concrete elements enterprises.

The 21st CPSU Congress has provided the building materials industry

with the task of raising, by the end of the Seven-Year Plan, its annual output of precast, reinforced concrete to 42-45 million cubic meters. This means that the consumption of cement for producing that output will total approximately 15 million tons a year.

A reduction in the non-productive expenditures of cement during the fabrication of precast, reinforced concrete by one percent only will make it possible to save 150,000 tons of cement annually, in respect to the national economy. In many cases the extent of the reduction in these non-productive expenditures could be much greater. This underlines the special importance of the attention which the precast, reinforced concrete enterprises should devote to saving cement. The reduction of expenditures on the production of precast, reinforced concrete will, in the final analysis, affect favorably the reduction in construction costs.

2. Ways to Develop the Construction Industry in Rural Areas

/This is a translation of an article written by G. Prozorovskiy in Ekonomika Stroitel'stva, No 11, Nov 1959, pages 7-11./

. . .The volume of rural construction is growing from year to year. During the present Seven-Year Plan the kolkhozes and sovkhozes expect to build livestock accomodations and silos structures of an aggregate worth of 112 billion rubles, and production and storage facilities valued at 75.6 billion rubles. The expenditures on water-development measures will total 26.8 billion rubles, and on rural electrification -- 19.3 billion rubles. During the same period, cultural and communal buildings valued at 34.8 billion rubles, and residential buildings valued at 162.5 billion rubles will be erected.

The over-all program of rural construction for the seven-year period will total approximately 460 billion rubles -- nearly one half the volume of urban construction. The raising of the technological level and reduction of the estimated costs of that construction acquire major national-economic importance. . . .

According to certain data labor productivity in rural construction is three to four times lower than in urban construction. Thus, e. g., in 1958 in Orlovskaya Oblast the mean daily output amounted to 29 rubles, whereas under urban conditions it is at a level of 100 rubles.

The increase in labor productivity in construction hinges primarily on the employment of prefabricated components and the mechanization of construction operations. This is absolutely correct for both urban and rural construction. The solving of this problem should be preceded by the drafting of technically perfect designs providing for a maximal use of precast reinforced concrete and industrial methods of erecting buildings.

At present, standard designs have been developed for rural buildings and structures incorporating precast, reinforced concrete. These designs (especially those of livestock accommodations) are oriented toward the use of 150 to 180 cubic meters of precast, reinforced concrete per million rubles of construction and installation operations. Actually, however, the use of precast, reinforced concrete in rural areas does not exceed 20 cubic meters per million rubles worth of these operations, i. e., actually, out of every 100 objects 10 are built according to technically perfect designs, and the remaining 90 buildings are construc-

ted from non-durable materials and by cottage-industry methods. Although at the beginning of 1959 standard designs were used in 84 percent of the construction of livestock accommodations, their actual execution has often been accompanied by the replacement of precast, reinforced concrete structures by monolithic-concrete ones, and of capital solutions by provisional ones; therefore, the above-cited percentage is nominal in nature. Residential buildings are built by the kolkhozniks and rural intelligentsia mostly from lumber or raw-clay materials and not on the basis of designs. An analysis of the existing situation indicates that the industrialization of construction in the countryside is at present restricted not so much by the absence of technically perfect standard designs as, chiefly, by the insufficient development of the construction base in regard to production of building materials and components.

The rising volume of rural construction requires a well-developed production of high-grade building materials. During the present seven-year period an average of 20 billion units of nominal bricks will be needed annually, whereas in reality only 10 billions are being produced annually in the countryside; also, 2.4 million tons of lime will be needed, but no more than 50,000 tons of that material are actually being produced annually. Even worse is the situation in regard to the needs of rural construction for roof tile, gypsum, natural stone, and other local materials.

The efforts of individual kolkhozes to produce local building materials do not yield the proper effect. The kolkhozes, in the majority of cases, set up small, seasonal enterprises whose output is often substandard and expensive to produce. The shortage of local building materials is compensated in the kolkhozes by an irrational use of lumber. Even in the unforested regions of the country the kolkhozes consume over 1,000 cubic meters of lumber per million rubles worth of construction and installation operations, whereas in urban areas such consumption does not exceed 400 cubic meters. To be sure, local raw-clay materials are also broadly used in many unforested regions. Unfortunately, however, such construction is conducted on a low technological level, and the buildings thus erected prove to be nondurable and uneconomical. Moreover, the production of these materials is unmechanized, labor-consuming and, hence, inexpedient. Consequently, the most important task of rural construction is to establish its own building materials industry on the principle of strengthening production ties among the kolkhozes.

It is necessary to develop the production of cheap

local materials in rayon- and oblast-scale inter-kolkhoz enterprises. Calculations show that the basic building materials (for foundations, floors, partitions), accounting for 85 to 90 percent of the total weight of buildings, cannot be expediently shipped over distances greater than 40 to 50 kilometers. It is precisely these distances that are characteristic of the majority of the rural administrative rayons. Hence, a major part of the materials should be shipped only within the confines of a single rayon. On the oblast scale, it is necessary to organize the production of binding, roofing, finishing, etc., materials with low volume weight, and logging operations. The enterprises designed for the needs of a rayon and, partly, of an oblast, prove to be sufficiently large and, hence, technically more efficient than the kolkhoz-maintained plants.

In recent years many livestock buildings and repair shops have been consttucted of precast, reinforced concrete. However, the construction of these objects was predominantly done under the patronage of urban construction organizations and enterprises of the construction industry fabricating precast, reinforced concrete components with their own resources. This assistance has played a positive role in the drive to extend industrial methods of construction to the countryside. At present the situation has changed; the kolkhozes have gained in economic strength and can now afford to earmark the necessary funds for establishing inter-kolkhoz construction organizations. Therefore, the main trend consists in the establishing of inter-kolkhoz enterprises of the construction industry which will manufacture prefabricated components and structures. At the same time it is necessary to increase the deliveries to the countryside of building materials and components from the sovnarkhoz enterprises, for which purpose it is necessary to utilize the reserve capacities and to provide for such reserves during new construction. . . .

3. Local Cementing Materials in Construction

/This is a translation of an article written by A. Shchepetov in Stroitel' (Builder), No 10, Moscow, Oct 1959, page 14./

In the fabrication of certain concrete and reinforced concrete structures and components, and in the preparation of bonding mortars, it is necessary to employ more broadly local cementing agents instead of high-grade cements, which still are scarce. Calculations show that in this way it will be possible to save up to 15 percent of the total amount of high-grade cements consumed in the preparation of mortars and low-grade concretes. The production of local cementing materials requires 20 to 40 percent less capital expenditures and fuel consumption than does the production of portland cement (when calculated per cubic meter of concrete or mortar).

Long-range observations have shown that elements and structures fabricated from local cementing materials display sufficient resistance to frost and air, if the composition of these materials is properly selected.

At present the Gosstroy SSSR /State Committee on Construction of the Council of Ministers USSR/ has approved "Directives for the Production of Local Cementing Materials and Their Use in Construction." According to these Directives, local cementing materials are divided into three independent groups according to their principal use in construction.

The cementing materials in the first group can be used in the same way as portland-slag cements of the "150"-"250" grades, and they are suitable for the production of reinforced concrete elements. Basically, they are represented by slag and natural lime-pozzuolanic cementing materials to which 20 to 40 percent of portland cement is added.

The slag cementing materials of this group can be produced from blast-furnace slags (inclusive of dump-heap slags), which are unsuitable for the production of portland-slag cements. It is recommended that these cementing materials is prepared in the following compositions (in percent by weight): nonstandard granulated blast-furnace slag -- 60 to 80 percent, portland cement -- 20 to 40 percent; basic dump-heap blast-furnace slag -- 55 to 65 percent, portland cement -- 20 to 35 percent, a siliceous admixture (tripoli, ashes, etc.) -- 10 to 15 percent; acidic dump-heap blast-furnace slag -- 60 to 80 percent, portland cement -- 20 to 40 percent.

The natural lime-pozzuolanic cementing materials are represented by mixtures of basic fuel slags and ashes containing up to 15 percent calcium oxide with acidic aqueous admixtures. It is recommended that these cementing materials be prepared in the following compositions (in percent by weight): shaly or other lime-containing ash -- 55 to 60 percent, portland cement -- 25 to 35 percent, and siliceous admixture -- 10 to 15 percent.

The cementing materials in the second group are used to produce nonreinforced low-grade concretes and construction mortars; it is not recommended that they be used in producing reinforced concrete components. This group is represented by lime- or sulfate-slag cementing materials based on granulated blast-furnace slags, and also by lime-pozzuolanic cementing materials (mixed and natural) either without the addition of portland cement or containing not more than 20 percent of that cement in the mixture. In this connection, portland cement can be introduced directly into the mortar or concrete mixture while it is being prepared. These cementing materials are prepared in the following compositions (in percent by weight): lime-slag cementing materials -- 70 to 90 percent of granulated blast-furnace slag and 30 to 10 percent of construction lime; sulfate-slag cementing materials -- 80 to 85 percent of granulated blast-furnace slag, 10 to 15 percent of gypsum, and five percent of portland cement (or two percent of lime); natural lime-pozzuolanic cementing materials -- 70 to 80 percent of lime-containing (shale, peat, etc.) ashes, and 20 to 30 percent of siliceous admixture (tripoli, "glinit" [argillite?], etc.); mixed lime-pozzuolanic cementing materials -- 50 to 60 percent of fuel slags, ashes or volcanic rocks and 40 to 50 percent of construction lime, or 40 to 50 percent of a mixture of sedimentary siliceous rocks and 50 to 60 percent of construction lime.

The lime-slag and sulfate-slag cementing materials can be used in heavy and light concretes (of grade "100" and lower) for the production of nonreinforced components, and also for the production of components for shoring up foundations and floors. They also can be used in bonding mortars (up to grade "50" inclusively) and for constructing foundations and erecting walls (inclusive of the masonry executed by the freezing method). Upon the addition of portland cement (up to 20 percent) the lime-slag cementing material becomes suitable for the mortars used in stone masonry subjected to alternate freezing and thawing with simultaneous humidification.

The lime-pozzuolanic cementing materials (mixed and

natural) can be used for producing natural-hardening concretes (of grade "50" and lower) for shoring up foundations and floors not designed for heavy equipment and transport. They are also used in bonding mortars (up to grade "25" inclusively), which includes their use in bonding the foundations laid above the ground-water level at temperatures of 10°C and higher. Upon the addition of portland cement (15 to 20 percent) it is permitted to use the lime-pozzuolanic cementing materials in mortars for wetted masonry exposed to alternate freezing and thawing, as well as for stone masonry erected by the freezing method and foundations laid below the ground-water level.

The third group of local cementing materials includes the powders of blast-furnace slags and lime-containing fuel ashes with activizing or plasticizing admixtures (in the amount of up to 15 percent), or without such admixtures. The slag, shale-ash and other powders are processed into cementing materials by admixing lime or cement, and they can be used in construction mortars up to grade "10" inclusively. Ground unslaked and hydrate limes with admixtures also are placed within the third group, and they are used for producing silica elements in autoclaves.

The production of local cementing materials displays specific features which have to be kept in mind. The preference is for dry and ground raw materials which make it possible to exclude from their production process the operations of crushing and drying, and also for materials needing little water for slaking, which ensures a higher strength and durability of structural elements.

The fineness of the grinding of local cementing materials should correspond to the fineness of grinding of cement, in which connection the lime-pozzuolanic and lime-slag cementing materials should satisfy higher requirements: the residues on screens No 02 and No 09 should not exceed one and 10 percent, respectively.

4. Concentrate All Effort on Fulfillment of the Great Tasks of Communist Construction

[This is a translation of an unsigned article in Steklo i Keramika (Glass and Ceramics), No 11, Moscow, Nov 1959, pages 1-2.]

On the eve of the Anniversary of the Great October, workers from all branches of industry are reporting on the successful course of the implementation of the targets for 1959 -- the first year of the Seven-Year Plan.

Like all the Soviet people; the collective of many thousands of workers of the glass, ceramics and porcelain-faience industry celebrates this great holiday with much pride. This is strikingly attested by the indexes of the fulfillment of the State plan.

During the first nine months of 1959 the gross output surpassed the planned target by more than 400 million rubles or 8.2 percent and, compared with the corresponding period in 1958, it rose 13.3 percent.

The output of all types of products has increased without exception. During the first eight months of this year the increment in the output of polished glass amounted to 370,000 square meters (7.9 percent) above the corresponding period last year; structural porcelain -- 210,000 units (14 percent); ceramic flooring tile -- 417,000 square meters (7.6 percent); bottles -- 96 million units (14.3 percent); ceramic sewage pipes -- 18,000 tons (nine percent); assorted glassware -- 63 million rubles (14 percent); porcelain and faience ware -- 53 million rubles (10.5 percent).

The output of glass fibers has risen at a particularly rapid pace. During the first eight months of 1959 the output of glass fibers of all types was 138 percent greater than during the corresponding period in 1958.

With regard to the level of output of one of the most important building materials -- window glass -- the USSR outdistanced all other countries last year, including the United States.

This year, in our industry, new plants, shops and technological lines with high output capacities are being activated and mastered.

The Saratov Glass Works, one of Europe's largest industrial glass enterprises, which was activated at the end of last year, is increasing, month by month, the pace of its production of large-size polished glass. After the grinding-polishing conveyer line at that plant is brought up to its full output capacity in the immediate future, it

will become possible to double the output of polished glass in our country. The Saratov Plant is also completing the construction of a large technological line which will provide the Volga Region with nine million square meters of glass annually.

In the Far East the Amur Glass Works has been activated; its output capacity exceeds six million square meters of window glass annually. The construction of the Krasnodar Porcelain Plant, with an output capacity of 15 million products annually, is nearing completion.

The "Proletariy" Glass works has activiated a new conveyer line for grinding and polishing sheet glass, which has an output capacity of 250,000 square meters annually. The construction of the Bryansk and Kerch' glass container plants is being advanced at a forced pace.

The Khar'kov Tile Plant has recently activated its fifth technological line for the production of Metlach tile, with an output capacity of 500,000 square meters annually. At the Stalingrad Plant, a shop with twice as high an output capacity for the production of the same tiles is being activated.

Three new large structural porcelain shops with an aggregate output capacity of 930,000 products annually have been erected in the Lobnya, Kuybyshev and Slavuta ceramics plants. . . .

5. Great Strides in the Construction Industry

/This is a translation of an unsigned article in Stroitel'naya Gazeta (Construction Gazette), Moscow, 4 Nov 1959, page 2./

The following are a few lines from the report of A. N. Kosygin at the Third Session of the Supreme Council USSR: "The Development of the Construction and Building Materials Industries is Being Ensured With Capital Investments Aggregating Approximately 16 Billion Rubles."

Sixteen billion rubles! to visualize this figure, let us merely say that this is more than the funds assigned for the development of ferrous metallurgy, and nearly as much as the funds planned for the chemical industry and nonferrous metallurgy taken together!

This is only understandable. To assure a gigantic expansion of all branches of the country's national economy, a highly developed construction industry is necessary.

We face the task of developing the building materials industry at such a rapid pace that a comparison of the new volume of output with the old pre-Revolutionary one will no longer be sensible. How is one to compare, e. g., the 1.5 million tons of cement produced by Tsarist Russia in 1913 with the quantity planned for 1960? At present many individual sovnarkhozes produce just as much cement. Even individual enterprises, cement combines and plants have greatly outdistanced this figure.

Let us cite yet another excerpt from Comrade Kosygin's report: "The output of cement will total 45.5 million tons, or 6.7 million tons more than in 1959. This increment alone is much greater than the entire output of cement in 1940."

What do 6.7 million tons signify? How is one to visualize them in construction? Let us say, e. g., that this quantity is sufficient to produce over twenty million cubic meters of precast reinforced concrete structures. If these are used as large panels for building prefabricated houses, they will permit the construction of over one and one half million apartments.

Moreover, this is not the actual yearly output of cement but merely the increment in that output within one year. If we consider all the 45.5 million tons which will be produced in 1960 and use them in, e. g., road building, they will serve to build a highway that would encircle the terrestrial globe twice.

But, of course, the cement will be used not for such fantastic purposes but for fully rational ones -- construction

of new electric power plants and blast furnaces, petroleum and gas plants, spinning and weaving mills; bridges, residential buildings, motion picture theatres, and kindergartens.

Quite recently, in 1956, we produced less than half as much cement as the United States. Now the situation has changed. During individual months in 1959 we produced nearly as much cement as the United States. Thus the Soviet Union is overtaking America.

As for its output of asbestos-cement products our country has no equals in the world. This principal branch of the building materials industry continues to advance with seven-league strides. The increment in the output of slate alone in 1960 will amount to 475 million nominal tiles. This increment alone will suffice to roof three- and four-story buildings with a combined area of over 50 million square meters! As for the total output of slate in that year, it will be seven times greater than in 1949!

In nominal terms of products with a 100-millimeter diameter, the output of asbestos-cement pipes in 1960 will amount to fifty thousand kilometers. A tube of such length could be looped around the entire globe and still leave a free end sufficient to lay a line from Moscow to Vladivostok.

Cement combined with asbestos constitutes roofing materials and pipe. When combined with metal, it constitutes foundations, walls, roofings, girders and pillars.

The output of reinforced concrete structures and components increase by more than five million cubic meters annually. The output of wall panels will climb steeply. In 1960 enough wall panels will be produced to construct more than one hundred thousand apartments.

Basically, the increase in the output of building materials in 1960 will occur as a result of the expansion and modernization of existing enterprises. A considerable part of equipment will be replaced by new and more productive equipment. The degree of the mechanization and automation of production processes will be raised still higher.

In 1960 the output of window glass will approximate 145 million square meters. Compared with 1959 the increase in this output is seemingly insignificant -- only six or seven percent. However, in that year considerable qualitative changes will occur in the glass industry. Several large glass works will convert to natural gas and liquid fuel. This will make it possible to intensify the process of founding the glass mass, and hence also to intensify the transformation of that mass into window and industrial glass. The production costs will decline appreciably, inasmuch as

the conversion of plants to natural gas and liquid fuel will make it possible ultimately to resolve the problems of the mechanization and automation of glass production.

The increase of temperatures in glass-founding furnaces requires better refractories. In 1960 the Bryansk Mullite Plant will start the production of the first high-grade refractories.

Casementless window blocks are finding widespread use in housing construction. These require uniform three-millimeter glass. The plans for 1960 provide for doubling the output of such glass compared with 1959. The Saratov Glass Works will activate a window shop equipped with new machines for drawing a two-meters-wide strip.

In 1960 the Gomel' Plant will commence the production of storewindow glass three meters wide and measuring up to 12 square meters.

Such is the advancing development of not only these but also other branches of the building materials industry -- that solid foundation for the construction industry.

6. Decisive Stage in the Integrated Electrification of the USSR

/This is a translation of an article written by P. Neporozhniy in Stroitel'naya Gazeta, 25 Nov 1959, page 3./

The volume of power construction envisaged in the Seven-Year Plan is so enormous that its fulfillment will necessitate a radical alteration of the existing methods of conducting the related work, as well as the development of totally new methods. Of tremendous importance to the realization of these tasks are the decisions of the 21st CPSU Congress, which have indicated the paths of a broad industrialization of construction, transformation of construction production to a mechanized process of assembling and installing buildings and structures from blocks, parts and components fabricated under plant conditions.

All electric power stations, and primarily the thermal ones, and also the electric transmission lines, should be constructed in plants. The present time is marked by the extensive and complex process of a radical change in the established technology of constructing power enterprises.

For the conversion to the plant method of the construction and installation of electric power stations and transmission lines, the design institutes of the Ministry of Power Station Construction /hereinafter referred to as "the Ministry"/ have drafted appropriate standard designs. They provide for standardization and "typization," for maximal assemblability of structures and a sharply reduced number of types of individual structural components. The assemblability of basic equipment will also be raised to its maximum.

In this connection, enormous importance is being acquired by the reduction in duration of the preparatory periods of construction, restriction of the number of temporary and subsidiary-auxiliary structures previously erected directly on construction sites. The center of gravity of the preparatory period should be shifted to permanent regional bases of the construction industry. A minimal number of temporary subsidiary enterprises technologically dependent on the construction sites should be transferred to these sites in the form of finished mobile or collapsible units.

The experience in the construction of thermal electric power stations based on precast structures of reinforced concrete has shown that five to seven times as much labor is expended on construction operations than on the installation of basic equipment. Also, more time is expended

on construction operations. In effect, the total weight of the precast, reinforced concrete in the currently constructed thermal electric power stations (excluding basic equipment) accounts for 88 percent of the total weight of all their structures. This means that the solution to the problem of accelerating power construction and cutting costs can be found in the transition to industrial methods, and in conversion of the construction site to an assembly site using industrially manufactured structural parts and components from large regional bases, so that these parts and components can be shipped over large distances.

Calculations show that in the erection of electric power stations the substations and electric transmission lines envisaged in the Seven-Year Plan will require 22.7 million cubic meters of precast, reinforced concrete structures. The Ministry's existing (as of 1 October 1959) output capacity of the reinforced concrete structures plants can satisfy only approximately one third of this demand. A nearly analogous situation exists also with regard to the other bases of the construction industry.

Such a situation regarding these principal types of power construction is, of course, unacceptable. The Orenergostroy /State Institute for the Adoption of Advanced Methods in Power Construction/ has, jointly with the design institutes Teploelektroproyekt, Gidroproyekt and Gidroenergoproyekt /All-Union State Institute for the Design and Planning of Thermal Electric Power Stations, All-Union State Institute for the Design and Planning of Hydraulic Engineering Structures, and All-Union State Institute for the Design and Planning of Hydroelectric Power Stations/, drafted a plan for the development of the enterprises of the construction industry, and the creation of large regional and interregional bases fully ensuring the delivery of prefabricated structures for power units. The plans provide for substantial expansion of the output capacities of the construction industry as early as in the first years of the Seven-Year Plan, through the renovation and modernization of equipment and the establishment of new bases. In particular, that industry's output of reinforced concrete structures will be tripled; the output of such structures for wall panels will increase ninefold, and for centrifuged LEP /electric transmission line/ poles -- tenfold.

No less indicative is the planned expansion in the capacities for the production of other materials too. Thus, the capacities for the output of nonmetallic mineral raw materials will increase one and one half times, for the output of metal structures -- twice; boiler and auxiliary

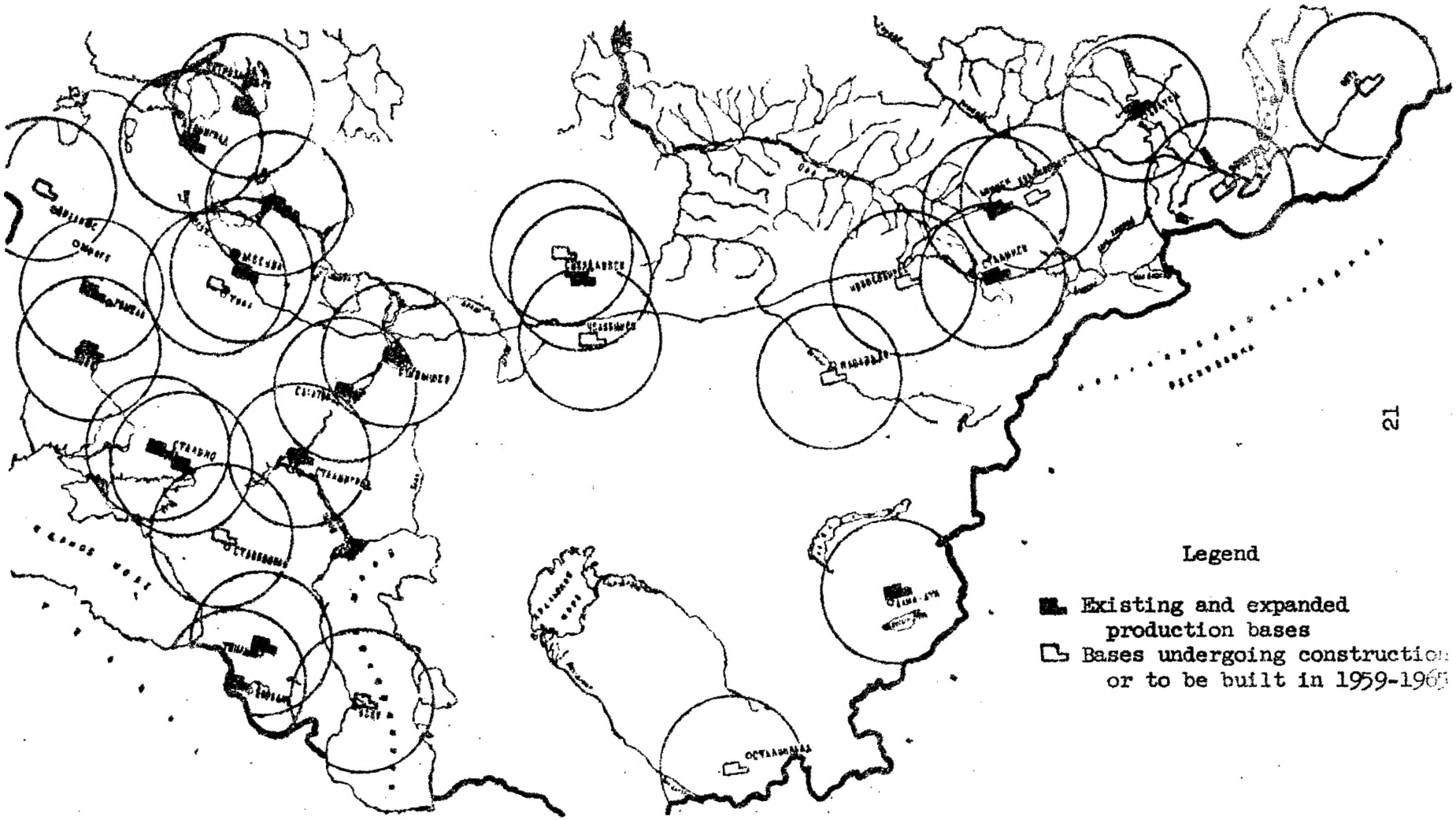
equipment -- seven times; insulation materials -- 12 times, and repair bases -- thrice.

The new large regional and interregional bases will be subordinated to the Glavenergostroyprom -- the Main Administration of Construction Industry, organized within the Ministry.

The implementation of the intended program of strengthening the technical base requires sizable capital investments. During the seven-year period 3,730,000,000 rubles will be invested in the Ministry's construction industry. The largest investments are, naturally, earmarked for the region of Central Siberia -- 994 million rubles, followed by: Volga and Central USSR regions -- 892 million rubles; Urals -- 615 million rubles; Northwestern European USSR -- 225 million rubles; Kazakhstan -- 162 million rubles; Transbaykal and the Far East -- 124 million rubles; Georgian, Azerbaydzhan and Armenian SSRs and the Northern Caucasian area of the RSFSR -- 116 million rubles; Northern European USSR -- 44 million rubles; and Central Asia -- 35 million rubles.

The materialization of such an extensive plan of development of its construction industry will enable the Ministry of Power Station Construction to convert as of 1963 to the industrial fabrication of all structures and components in regional and interregional bases, with deliveries of complete sets to construction sites.

The geographical distribution of the regional bases for the manufacture of prefabricated parts for power construction -- each having an individual radius of action 800 kilometers in length -- as illustrated in the figure.


Legend
Existing and expanded production bases
Bases undergoing construction or to be built in 1959-1965

What do these bases represent?

A typical base is the Pavlodar Interregional Production Base now being established for the fabrication of complete sets of structural parts for the power structures in Pavlodarskaya, Akmolinskaya and Karagandinskaya oblasts. It will consist of a reinforced concrete components plant with an output capacity of 50,000 cubic meters annually, and an open-air installation for large parts with an annual output capacity of 15,000 cubic meters. Furthermore, it will include shops for the production of piles and pedestals for electric transmission lines, with an output capacity of 20,000 cubic meters. The shop for the production of centrifuged poles will produce 12,000 cubic meters of these poles annually; the wall panels shop will produce 30,000 cubic meters of wall panels annually; the concrete plant will produce annually 100,000 cubic meters of concrete and 30,000 cubic meters of mortar.

Moreover, the base's enterprises will include a lime plant with an output capacity of 15,000 tons, an asphalt-concrete plant designed for 25,000 tons, a gravel-and-sand quarry with a concentrator plant, designed for 200,000 cubic meters annually. Similar bases will be established in Kaunas, Mogilev-Podol'sk, Nazarov, Lyubertsy near Moscow, and other areas of the country.

The large complex regional enterprises of the construction industry will also be established on the basis of the existing subsidiary industries under the jurisdiction of the Ministry's trusts, through their renovation, equipment modernization, and expansion.

Plans exist for a narrow specialization of the existing plants and shops in regard to individual types of prefabricated parts and components, upon reducing these types to their minimum. This will make it possible not only to increase the productivity of the plants and shops but also to reduce drastically the production costs. For example, the project for the modernization of the precast, reinforced concrete plants under the jurisdiction of the Kuybyshevgidrostroy /Kuybyshev Trust for Hydraulic Structures/ has such a purpose.

As a result of specialization, improvements in production technology, replacement of obsolete equipment, and establishment of mechanized and automated continuous-flow production lines, the output capacities of these plants will be more than doubled. It is of interest also that the capital expenditures per additional cubic meter of precast, reinforced concrete obtained as a result of the modernization of old plants will be less than half as low as the analogous

expenditures for a new enterprise.

Mechanized automatic continuous-flow lines will operate in the production bases. While one such line will produce pillars and collar beams for the main and auxiliary powerhouses of the TETses and GRESes /Thermal Electric Power Stations and State Regional Electric Power Stations/, another will produce foundations and other massive structures; a third -- reinforced foam concrete panels and wall panels with reinforced-cement shells; a fourth -- centrifuged transmission-line poles with prestressed reinforcement; a fifth -- large-bore pressure pipe; molds and roofs, etc., will also be fabricated on separate continuous-flow lines.

Provisions are being made for a new technology of the production of prefabricated components for thermal electric power stations and electric transmission lines. Thus, structural reinforced concrete will be produced by the method of vibro-pressing on a stand with a "VShM-2" machine, the first models of which are being assembled in the Ministry's plants. It is expected that the construction of main powerhouses and auxiliary shops in thermal electric power stations will be ensured by the production of three-layer panels consisting of thin reinforced-concrete shells laminated with foam concrete or slag felting.

A technological line equipped with "MTsO02" machines is being devised for the production of prestressed, reinforced concrete poles, up to 26 meters long, for electric transmission lines.

The construction and equipping of the numerous continuous-flow lines require the mastering of new equipment; for this purpose, active assistance can be provided by the country's machine building industry.

Power builders also have the right to expect cooperation from the sovnarkhozes in satisfying partially the demand of the Ministry's construction sites for cellular concrete, wall materials for industrial and housing construction, and local building materials -- sand, gravel and rubble. Examples of such cooperation already exist. The Pavlodar; Chita, and a number of other construction-industry bases, are being designed on such principles.

The construction of these bases will mark a major advance along the path of industrialization of power construction, and it will make it possible to carry out the "assembling" of electric power stations on a genuinely industrial continuous-flow basis. This, in turn, will result in increasing labor productivity and speeding up the activation of new output capacities.

According to calculations executed by Orgenergostroy

Institute, the funds invested by the State in establishing the Ministry's construction industry not only will be recouped withing the seven-year period but also will assure direct savings on investments in power construction.

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